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reviewer, strained in many places, it nevertheless has an important function in the arrangement of material, and inherent interest of its own as the matured expression of opinion of one of the makers of modern biology; but one can not say that it has promise as a working program; it represents the biological conceptions of the nineteenth rather than of the twentieth century.

The book is full of interest, and may be profitably consulted by working biologists of all grades and laymen alike.

F. R. L.

Chemical Phenomena in Life. By FREDERICK CZAPEK, M.D., Ph.D., Professor of Plant Physiology in the University of Prague. New York and London, Harper and Brothers. 1911. Pp. ix + 151.

We have before us bearing the above title an extremely interesting and valuable little book included in Harper's "Library of Living Thought." This book should prove to be of great interest to all those interested in the chemistry of life. And I take it that there are no students to-day interested in biology who are not insensibly drawn into the consideration of those varied chemical phenomena so highly characteristic of living things. To the botanist who is familiar with Czapek's "Biochemie der Pflanzen" in the German this little book (really a condensation of that great work) comes with particular interest. It was indeed a most difficult task, as the author admits, when it was attempted to put in condensed and rather *popular* form the subject matter with which he has busied himself for so many years. But it seems that this has been accomplished in a most admirable manner. However, it must not be supposed that this little volume is easy to read and understand; it is far from being adapted to the beginner in biology. The author states in the preface that "a fair knowledge of physics and chemistry, both organic and physical, is required, besides the great number of biological facts which must be remembered when we try to obtain a satisfactory survey of the general physiology of the plant." Consequently this

book will be of most value to those who have had a university training which included the above requirements.

With Czapek's well-known contributions to this field of botany all that is necessary to do to portray the value and scope of this book is to indicate the chapter heads as follows: Biology and Chemistry; Protoplasm and Its Chemical Properties; Protoplasm and Colloid-chemistry; the Outer Protoplasmatic Membrane and Its Chemical Functions; Chemical Phenomena in Cytoplasm and Nucleus of Living Cells; Chemical Reactions in Living Cells; Velocity of Reactions in Living Cells; Catalysis and the Enzymes; Chemical Actions on Protoplasm and its Counter-actions; Chemical Adaptation and Inheritance.

Certainly every student of botany should have a copy of this book, and should read it again and again, not only for the considerable amount of subject matter here precipitated from a mass of bewildering details, but also because of the broadening of the point of view that is certain to result from its careful study.

RAYMOND J. POOL

THE UNIVERSITY OF NEBRASKA

*STANDARDIZATION OF THE ACCOUNTS
OF LEARNED SOCIETIES*

THE United States is now supporting somewhere between 100 and 200 societies of which the object is the extension of learning, the promotion of science and common action in some field of intellectual endeavor. In a country so rich and so generous as the United States, it is not difficult to obtain support for such enterprises, and new ones are added every year. Still many of them find it hard to make both ends meet; a few are able to accumulate a permanent fund.

The accounts of these societies are almost all reported, and in most cases printed, every year; and it might be supposed that institutions founded for the inculcation of truth, exactness and efficiency would give to their supporters a detailed, analytic statement of receipts and expenditures. This is, however, far from being the case. The accounts of the societies are in general brief and far from self-

explanatory. An illustration of the methods of some of the societies, and a test of their thoroughness in keeping accounts is the annual statement for the last year available when this article was prepared, for each of four large and active national societies in kindred fields: namely, The American Academy of Political and Social Science, the American Economic Association, the American Historical Association and the American Political Science Association. Following are the reports of these four societies:

THE AMERICAN ACADEMY OF POLITICAL AND
SOCIAL SCIENCE
SUMMARY OF INCOME AND EXPENDITURES FOR
THE YEAR ENDED DECEMBER 31, 1910
Cash on hand January 1, 1910 \$7,745.38

Income

Annual membership fees	\$22,610.16
Life memberships	709.64
Special contributions	1,510.00
Subscriptions to publications and sales thereof	8,274.70
Income from investments ..	2,361.91
Income from bonds matured	4,500.00
Interest on deposits	139.02

	40,105.43

	\$47,850.81

<i>Expenditures</i>	
Clerical services	\$6,008.18
Printing stationery and post- age in connection with publication of <i>Annals</i> and with general correspond- ence	19,269.82
Office expenses	2,851.01
Expenses of meetings	2,243.74
Profit and loss	5.00
Investments purchased	
	\$12,975.00
Interest, premiums and commissions on above purchases ...	266.56

	\$13,241.56

Balance, December 31, 1910	43,619.31
Distributed as follows:	
Mortgage Trust Co. of Penna.	\$3,807.50
Centennial National Bank	200.00
With A. S. Harvey	134.65
With E. Tornquist	100.00

	\$4,242.15
Less overdraft Academy Office	10.65

	\$4,231.50

REPORT OF THE TREASURER TO THE AMERICAN ECONOMIC ASSOCIATION
FOR THE YEAR ENDING DECEMBER 20, 1911

I. BALANCE SHEET

<i>Resources</i>		<i>Liabilities</i>	
Investment	\$1,000.00	Bills payable	\$1,000.00
Cash on hand	390.03	Accounts payable	1,003.60
Stationery on hand	50.00	Membership dues (prepaid)	674.82
Insurance (unexpired)	32.00	Guarantee fund (prepaid)	260.00
Furniture and fixtures Sec.-Treas. Office	162.00	Annual meeting (luncheon tickets purchased in advance)	331.65
Dues receivable	492.00		
Accounts receivable	155.00		
	\$2,281.03		
Deficit	989.04		
	\$3,270.07		
		\$3,270.07	

II. INCOME ACCOUNT

<i>Expenses</i>	<i>Receipts</i>
Quarterly printing	\$385.31
Economic Bulletin editorial	187.32
Economic Bulletin printing	475.33
	\$1,047.96
Proceedings and Handbook	1,423.86
Amer. Econ. Review printing	2,495.18
Amer. Econ. Review editorial and manuscript	2,956.40
Editors' expenses and supplies	1,279.01
	6,730.59
Secretary's Office:	
Office salaries	1,583.73
Traveling expenses	85.45
Stationery, including office print- ing	223.50
Office postage	440.15
Office supplies	162.71
Telegraph and telephone	26.37
Express, freight and cartage	14.50
Miscellaneous	27.98
	2,564.39
Rent (storage of stock)	91.67
Insurance	33.08
Annual meeting	216.05
	Deficit for the year ..
	\$12,107.60
	\$12,107.60

III. SURPLUS ACCOUNT

Deficit for year	\$2,373.16		
		Surplus at beginning of year	\$1,242.12
		Supplies as per inventory at begin- ning of year	142.00
			1,384.12
		Deficit balance at end of year ..	989.04
	\$2,373.16		\$2,373.16

THE AMERICAN HISTORICAL ASSOCIATION
REPORT OF CLARENCE W. BOWEN, *Treasurer*

<i>Receipts</i>			
Dec. 19, 1910			
Balance cash on hand	\$4,741.64		
Dec. 18, 1911			
Receipts as follows:			
2,569 $\frac{2}{3}$ annual dues at \$3.00	\$7,709.00		
1 annual dues at	2.99		
1 annual dues at	3.02		
7 annual dues at \$3.05	21.35		
23 annual dues at 3.10	71.30		
		3 annual dues at 3.15	9.45
		4 life member-	
		ships at 50.00	200.00
		Sales of publications	532.00
		Royalties	133.41
		Interest on bond and mort- gage	850.00
		Dividends on bank stock ..	200.00
		Sales of waste paper	7.67
		Loan, National Park Bank	1,500.00
			11,240.19
			\$15,981.83

<i>Disbursements</i>		
Dec. 18, 1911		
Treasurer's clerk hire, vouchers 16, 67, 70, 124, 136, 142	\$388.00	
Secretary's clerk hire, vouchers 17, 46, 52, 56, 58, 65, 74, 75, 88, 100, 109, 116, 127, 140, 141, 154, 156 ..	797.40	
Postage and stationery, Treasurer and Secretary, vouchers 13, 18, 24, 25, 31, 44, 47, 54, 55, 63, 66, 69, 76, 86, 89, 98, 99, 104, 105, 107, 108, 111, 115, 119, 128, 130, 133, 137, 145, 147, 155, 158, 161 ..	378.07	
Secretary of the council, vouchers 4, 34, 40, 83, 84, 126, 148, 149, 150, 176, 177	70.54	
Pacific Coast Branch, vouchers 79, 80	26.73	
<i>American Historical Review</i> , vouchers 38, 43, 49, 60, 71, 72, 82, 96, 113, 121, 146 ..	4,532.00	
Public Archives Commission, vouchers 30, 33, 42, 51, 85, 131, 151, 172, 178, 179 ...	370.55	
Historical Manuscripts Commission, voucher 68	30.00	
Committee on the Justin Winsor Prize, voucher 22	200.00	
Committee on Bibliography, voucher 103	50.00	
Committee on a Bibliography of American Travels, voucher 153	15.00	
Committee on a Bibliography of Modern English History, vouchers 6, 41, 125 ..	56.50	
Committee on the Certification of Teachers, vouchers 134, 135, 160, 163, 164 ...	28.93	
Committee of Five on the Teaching of History in Secondary Schools, voucher 50	5.00	
Committee on Historical Sites, vouchers 7, 8, 9, 10	49.05	
Committee on Indexing the Papers and Proceedings of the Association, vouchers 62, 81	150.00	
Committee on Writings on American History, voucher 39	200.00	
Conference of Historical Societies	15.75	
General Committee, vouchers 11, 12, 15, 93, 168, 181 ..	200.19	
Publication Committee, vouchers 28, 29, 35, 117	32.74	
Annual Report for 1908, vouchers 90, 91, 94, 102, 122, 123, 139	129.35	
Annual Report, 1909, vouchers 106, 138, 182	52.40	
Handbook, 1911, vouchers 26, 57, 61, 97, 118	494.43	
Executive Council expenses, vouchers 5, 27, 152, 162, 165, 166, 167, 170, 171, 173, 174, 180	2.80	
Editorial work, vouchers 19, 48, 53, 64, 73, 87, 101, 112, 114, 129, 144, 157	300.00	
Furnishing Secretary's Office, voucher 78	321.52	
Expenses Twenty-sixth Annual Meeting, vouchers 1, 2, 3, 20, 21, 36, 37	116.15	
Expenses Twenty-seventh Annual Meeting, voucher 159	1.70	
Bank stock, voucher 32	2,160.00	
Collection charges, vouchers 59, 92, 110, 132, 175, 183 ..	11.20	
Miscellaneous expenses, vouchers 14, 23, 45, 77, 95, 120, 143	1,545.40	
Balance cash on hand in National Park Bank	\$12,731.40	
	3,250.43	
	\$15,981.83	
Net receipts 1911	\$ 9,740.19	
Net disbursements 1911	11,231.40	
Excess of disbursements over receipts	\$ 1,491.21	

The assets of the Association are:

Bond and mortgage on real estate at No. 24 East 95th St., New York	\$20,000.00
Accrued interest from Sept. 29, 1911, to date	188.89
20 shares American Ex- change National Bank stock at \$250	5,000.00
Cash on hand in National Park Bank	3,250.43
	\$28,439.32
An increase during the year of ... New York, December 18, 1911	\$921.43

THE AMERICAN POLITICAL SCIENCE ASSOCIATION
REPORT OF THE TREASURER FOR THE YEAR 1911

Receipts

Balance on hand December 22, 1910 ...	\$ 7.30
Annual dues	3,770.00
Life memberships	150.00
Subscriptions	231.00
Publications sold	474.74
	\$4,633.04

Expenditures Aggregated

Legislative notes for <i>Review</i>	\$ 100.00
Clerical assistance to Secretary and Treasurer	465.00
Printing, stationery and mailing	3,060.85
Expressage on <i>Proceedings</i>	167.24
Postage and office expenses of Secretary and Treasurer	343.41
Payment on loan	400.00
Miscellaneous	74.40
	\$4,610.90
Balance on hand December 22, 1911 .	22.14
	\$4,633.04

The methods of these societies are so different, and the direction of their outgoes so varied, that no comparison is possible without an analysis and restatement of the accounts, as below.

These tables require some explanation: in the first place there is a difference in every case between the number of paying members (found by dividing the annual receipts from members' dues by the annual fee), and the recorded number of members. In societies

gaining rapidly in numbers they will never be the same, but where the difference is so great as appears in the Academy, viz., 945, the presumption is that a lot of paper members are being carried on the rolls.

The cash receipts are a function of two variables, the number of members and the annual fee: the Academy charges \$5 and has

RECEIPTS OF FOUR NATIONAL SOCIETIES
FISCAL YEAR 1910

	Am. Acad. Pol. and Soc. Sci.	Am. Econ. Assoc.	Am. Hist. Assoc.	Am. Pol. Sci. Assoc.
Memberships: Recorded members.....	5,467	1,850	2,925	1,350
Paying members.....	4,522	1,814	2,606	1,138

	<i>Cash Receipts</i>			
Memberships: Annual.....	\$22,610	\$5,621	\$7,817	\$3,444
Life	709	—	200	293
II. Publications: Subscriptions	\$23,319	\$5,621	\$8,017	\$3,737
Sales.....	8,275	842	—	183
Royalties.....	—	861	532	41
	8,275	1,703	665	597
III. Investments	2,501	101	1,050	—
IV. Contributions.....	1,510	2,309	—	—
Grand total.....	\$35,605	\$9,734	\$9,740	\$4,334
Invested funds and cur- rent balance	\$53,000	\$1,000	\$28,440	—

PUBLICATION BILLS OF THE FOUR SOCIETIES (1910)

	Am. Acad. Pol. and Soc. Sci.	Amer. Econ. Assoc.	Am. Hist. Assn.	Am. Pol. Sci. Assn.
Number of paying mem- bers	4,522	1,814	2,606	1,138
Proceedings: Pages.....	—	463	390	226
Total words.....	—	190,000	382,000	90,000
Cost.....	—	\$1,424	—	—
Periodicals: Pages.....	1,523	980	984	639
Total words.....	685,000	380,000	492,000	256,000
Prize essay: Pages.....	—	—	223	—
Total words.....	—	—	71,001	—
Total words paid for by societies	685,000	570,000	492,000	346,000
Total expense of print- ing publications.....	\$22,278	\$9,202	\$5,509	\$3,448
Expense per 1,000 words	32.50	10.10	11.20	9.97
Expense of publications.....	\$22,278	\$9,202	\$5,504	\$3,448
Receipts from publica- tions.....	8,275	1,703	655	597
Net expenditures.....	\$14,003	\$7,494	\$4,844	\$2,851
Paid to contributors.....	—	1,456	1,500	—
Net publication cost.....	\$14,003	\$6,043	\$3,344	\$2,851
Net cost per 1,000 words.	20.41	10.60	6.80	8.24

EXPENDITURES OF THE FOUR SOCIETIES
FISCAL YEAR 1910

	Am. Acad. Pol. and Soc. Sci.	Am. Econ. Assoc.	Am. Hist. Assn.	Am. Pol.Sci. Assn.
I. Administration :				
Salaries.....		1,584		
"Office expenses"	2,851	826	1,283	836
Sta., post., tel., etc.			378	
Trav. and cler. ex.		85	324	
Miscellaneous	3,000 ¹	125	1,557	96
Total	\$5,82	\$2,620	\$3,512	\$932
Per paying memb.	\$1. 1	\$1.44	\$1.35	\$0.81
II. Publications :				
Annual report.....			(Govt)	
Proceedings		1,424	677	800 ²
Periodicals.....			4,532	2,543 ²
Printing, sta., post.	16,270			
Printing.....		3,543		
Editorial salaries..		1,500	300	100
Contributors.....		1,456	—	—
Editors' expenses..		1,279		
Clerical services ...	6,008			
Total	22,278	9,202	5,509	3,448
Per paying memb.	\$4.98	\$5.07	\$2.11	\$3.03
III. Activities :				
Meetings	2,244	216	118	—
Coms. of investgn.			1,403	
Total	2,244	216	1,521	—
Per paying memb.	\$4.49	\$11	\$5.58	—
Grand total.....	30,378	12,038	10,572	4,380
Per paying memb.	\$6.71	\$6.63	\$4.05	\$3.84

¹ Total \$19,270; analyzed into items by guess.

² Total 3,348; analyzed into two items by guess.

nearly twice as many members as any of the other associations. None of the societies apparently makes a practise of soliciting life memberships.

The income from publications also varies, the Academy alone of the four societies having a notable sale for its publications outside its own members. The accounts of that society do not make a distinction between outside subscriptions and the sales of numbers to members of the society.

The Academy and the American Historical Association both have invested funds which add considerably to the income.

The Academy and the Economic Association in the year under review received considerable sums as contributions outright or as guarantees for some special enterprise.

The income of the societies varies from \$3,600 to \$40,000 a year. Those incomes, whatever their derivation or their source, should be considered as trusts to be administered for the benefit of the field of investigation and study represented by the society. All four of

the societies have systems of regular publications which, in order to furnish a basis of comparison, have been calculated according to the number of thousand words. The *Annual Report* of the American Historical Association is printed by the federal government, which much relieves its budget. Each of the societies maintains a periodical—that of the Academy considerably the most voluminous. The Historical Association also publishes a prize essay, which however pays for itself out of sales.

It is difficult to ascertain from the accounts precisely how much these publications cost; but by a careful study and aggregation of items, it appears that the Academy pays \$32.50 per 1,000 words, as against an average of about \$10.50 by the other three associations. The edition of the *Annals* of the academy is larger—perhaps twice as large—as any of the other three societies, but anybody knows that when plates are once made, the expense of running off additional copies is a comparatively small matter. On the other hand, the Academy's cost of publication is relieved by about \$8,000 of receipts. Here again the comparison is confused because the economic and historical periodicals pay contributors. Making allowance for those items it would appear that the net cost per words for the Academy is from two to three times that of the two sister societies.

In all the societies the publication forms one of three principal groups of expenditure. The Academy lumps under the head of "Printing, stationery and postage in connection with publication of *Annals* and with general correspondence, \$19,269.82." It is absolutely impossible from these figures to subdivide between general administration and publication; and therefore \$3,000 is by guess assigned to administration out of the total sum. On the basis of the paying members, the administration per member is about the same, but of course it ought to be distinctly less per capita for the larger society. The same remark applies to the per capita cost for publications: one of the advantages of a large membership is that it should reduce all print-

ing and administration costs. All of the societies maintain some sort of public activity. The Historical Association, and (since the date of this report), the Political Association, have moved in the same direction.

The net expenditure varies from \$30,000 for the Academy to \$4,000 for the Political Science Association. The measure of the effectiveness of these societies is however not the sums spent but the value of the work done. The Academy, with \$30,000 a year to spend, ought certainly to be lending a far greater aid to the problems of the general subject of history, government and economics than the three other societies with their combined income of \$27,000. How far that is the case must be left to the decision of those cognizant of the work of the four societies. One thing is certain, that none of the four societies furnishes a sufficiently detailed account; and that the report of the American Academy of Political and Social Science shows over \$20,000 a year expended for publications as against \$18,000 for the publications of the other three societies. The published accounts do not furnish a basis from which it is possible to find out why its cost per unit for carrying on and printing the publication should be twice as great as those of all the three sister societies doing the same kind of work. Here is an opportunity for a reform in corporate accounts.

ALBERT BUSHNELL HART

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SPECIAL ARTICLES

EVIDENCE THAT SODIUM BELONGS TO A RADIOACTIVE SERIES OF ELEMENTS

By the usual test for radioactivity, *i. e.*, the continued ionization of a gas independent of other physical conditions, sodium as an element does not display any activity that is definitely greater than that found in all matter. And the ionizing activity of ordinary matter is so slight that it can not be stated with definiteness whether or not it is of itself radioactive. But radioactivity implies a more fundamental change than that of emitting matter and energy continuously. It implies

an atomic disintegration. If α particles are emitted the atoms go by leaps and bounds to new atoms of other properties, while if β and γ radiations are emitted the wearing away of the atoms must be just as certain, though no one has been able to conjecture by what steps the change might take place.

Campbell and Wood¹ examined the sodium compounds for ionizing radiations. Their apparatus would have detected an activity much less than that of potassium, which is only one thousandth that of uranium. No radiations could be measured. The fact that a given element does not give out a measurable ionizing radiation is not necessarily evidence that it is not radioactive. For example, we may note the case of radium *D*, which gives no measurable radiations. Yet it disintegrates to half value in about forty years. It is therefore known as a radioactive element. Further, helium as an element may be classed as a radioactive element, providing all helium is of radioactive origin, although of itself no ionizing radiations are emitted. It is sufficient that an element be of radioactive parentage. Thus sodium is a radioactive element if it can be shown that it disintegrates into other forms of matter or if it is the result of the disintegration of other forms of matter.

If sodium is a radioactive element we may at present look for other evidence than direct radiations. We shall inquire if in past geologic time sodium has accumulated radioactivity from other matter, or, on the other hand, if sodium has disappeared or disintegrated into other forms of matter.

THE EVIDENCE FROM GEOLOGY

Geophysics furnishes two distinct lines of evidence which favor the hypothesis that sodium belongs to a series of radioactive elements. The first is based on the age of the earth as determined by radioactive data and by the accumulation of sodium in the ocean. The second is based on the relative accumulation in the ocean of sodium compared to chlorine, taken in connection with the relative

¹ Proc. Camb. Phil. Soc., 14, p. 15.